SunStar

USER'S MANUAL

KM-235A/B

High-speed, single-needle lockstitch sewing machine with automatic trimming devices (With FORTUNA AC SERVO MOTOR)

1) FOR AT MOST USE WITH EASINESS, PLEASE CERTAINLY READ THIS MANUAL BEFORE STARTING USE.
2) KEEP THIS MANUAL IN SAFE PLACE FOR REFERENCE WHEN THE MACHINE BREAKS DOWN.

SunStar CO., LTD.

MME-090929

1. Thank you for purchasing our product. Based on the rich expertise and experience accumulated in industrial sewing machine production, SUNSTAR will manufacture industrial sewing machines, which deliver more diverse functions, high performance, powerful operation, enhanced durability, and more sophisticated design to meet a number of user's needs.
2. Please read this user's manual thoroughly before using the machine. Make sure to properly use the machine to enjoy its full performance.
3. The specifications of the machine are subject to change, aimed to enhance product performance, without prior notice.
4. This product is designed, manufactured, and sold as an industrial sewing machine. It should not be used for other than industrial purpose.

SunStar CO., LTD.

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Safety rules for machines

Safety labels in the manual are categorized into danger, warning and caution. Failure to follow the safety rules may result in physical injuries or mechanical damages. The safety labels and symbols are defined as follows.

[The meaning of the safety labels]

⚠ Danger
Instructions here shall be observed strictly. Otherwise, the user will be killed or suffer severe physical injuries.

⚠ Warning
Instructions here must be observed, or the user could suffer fatal or severe physical injuries.

⚠ Caution
Instructions here should be observed, or the user could face physical injuries or mechanical damages.

[The meaning of symbols]

	This mark means a ‘must-not’
	This mark means a ‘must’ for safety
	This mark means that an electric shock may be caused if the instruction is not followed properly.

1-1) Machine mobilization Danger	Only personnel with a full understanding of the safety rules should move the machines. The following directions must be observed when delivering the machines. ⓐ At least two or more people should move the machine. ⓑ Before delivering the machine, thoroughly wipe off the oil on the machine to prevent accidents.
1-2) Machine installation Caution	Physical damages such as functional difficulties or breakdowns may occur depending on installation conditions of the machines. Be sure to heed the following conditions. ⓐ Remove the packing from top to bottom. Watch out for nails on the wooden box. ⓑ Install a climate controller and clean it regularly to prevent dust and moisture build-up from contaminating and corroding the machines. ⓒ Keep the machines away from direct sunlight. ⓓ Keep a minimum distance of 50cm between the machine at both sides and backside and the wall to secure sufficient space for repair ⓔ Do not operate the machine near areas with danger of explosion. Refrain from running the machine in the vicinity of risky places e.g., where a large quantity of aerosol-spraying products or oxygen are handled, unless specific guarantees are given otherwise for the operation of the machine to prevent explosion at such places. ⓕ The user should install an illuminator in the work area for the machine does not come supplied with any lighting apparatus due to the specific features of the machine. **[Note]** Details of the machine installation are laid out in No. 2 Installation.
1-3) Troubleshooting Danger	When the machine is in need of repair, only our authorized service technicians must handle it. ⓐ Before cleaning and repairing the machine, shut off the power supply and wait four minutes for the machine to discharge completely. ⓑ No part of the machine or specifications may be modified without prior consultation with our company. Any such modification could risk safe operation of the machine. ⓒ In case of repair, replace only with standard OEM parts from SunStar. ⓓ After repair, put safety covers back on the machine.

1-4) Machine operation

Caution

KM-235 Series are intended to be used for industrial purposes for sewing textiles and other similar materials. Carefully study the following instructions before operating the machine.

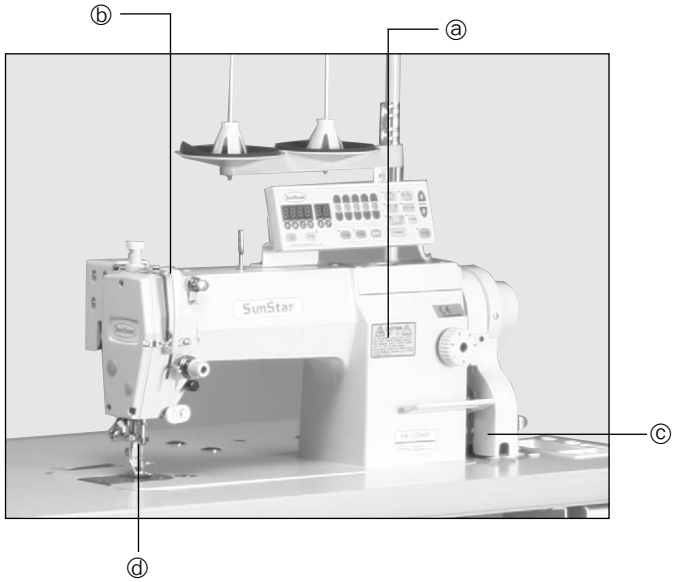
ⓐ Read the manual thoroughly and understand the instructions fully before use.
ⓑ Put on proper safety garments.
ⓒ While the machine is in motion, keep your hands or any part of your body away from moving parts, e.g., needle, hook, thread take-up lever and pulley, etc.
ⓓ Do not remove any form of safety covers while the machine is in use.
ⓔ Be sure to connect the ground (earth) wire.
ⓕ Before opening electric boxes such as the control box, shut down the power supply and make sure the power switch is in "off" mode.
ⓖ Stop the machine before threading the needle or checking after sewing work is finished.
ⓗ Never turn the power switch on with the pedal down.
ⓘ Do not use the machine if the cooling fan is clogged. Clean the air filter embedded in the control box at least once a week.
ⓙ Keep the machine away from strong electromagnetic fields such as high-frequency welding machines.

Caution	Always start the machine with safety covers in place since fingers or hands could be injured or cut off by the belt. Turn off the power switch when conducting a regular check on the machine.

1-5) Safety device

Caution

ⓐ Safety label: Safety instructions for machine operations
ⓑ Thread take-up lever cover: A device designed to prevent the human body from coming in contact with the thread take-up spring
ⓒ Belt cover: A device intended to avoid potential risks of getting hands, feet or clothes jammed by the belt
ⓓ Finger guard: A device built to keep fingers away from the needle.



1-6) Location of caution mark

CAUTION
경 고

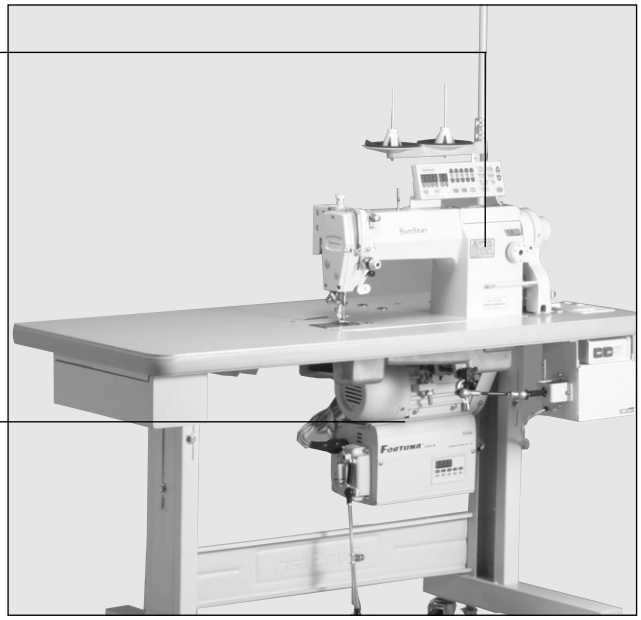
Do not operate without finger guard and safety devices. Before threading, changing bobbin and needle, cleaning etc. switch off main switch.
손가락 보호대와 안전장치 없이 작동하지 마십시오.
실, 보빈, 바늘교환시나 청소전에는 반드시 주전원의 스위치를 꺼 주십시오.

CAUTION
경 고

Hazardous voltage will cause injury.
Be sure to wait at least 360 seconds before opening this cover after turn off main switch and unplug a power cord.
고압 전류에 의해 감전될 수 있으므로 커버를 열 때는 전원을 내리고 전원 플러그를 뽑고 나서 360초간 기다린 후 여십시오.

"Caution" is attached on the machine for safety. Read the directions of "caution" carefully before running the machine.

[Location of caution mark]



1-7) Contents of Caution mark

Caution

CAUTION
경 고

Do not operate without finger guard and safety devices. Before threading, changing bobbin and needle, cleaning etc. switch off main switch.
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1 SPECIFICATIONS

1) Sewing machine

Type / Description	KM-235A	KM-235B
Application	For light and medium heavy materials	For heavy materials
Maximum speed	5,500 SPM	4,500 SPM
Maximum number of stitch	5mm	7mm
Needle used	DB x 1#14 (#9~#18)	DB x 1#21 (#20~#25)
Thread used	Cotton #30~#120	Nylon 150~250 DENIER
Height of feed dog	0.8mm~1mm	1.2mm
Feed dog	3 match for general, 4 match for heavy	3 match
Height of presser foot	Manual: 5.5mm, Knee: 13mm	Manual: 5.5mm, Knee: 13mm

2) Controller of Servo Motor

MODEL	VOLT	WATT	HERTZ
SC55-1A	1-phase 110V	550W	50/60 Hz
SC55-2A	1-phase 220V	550W	50/60 Hz
SC55-3A	3-phase 220V	550W	50/60 Hz

3) Peripheral automation devices (optional)

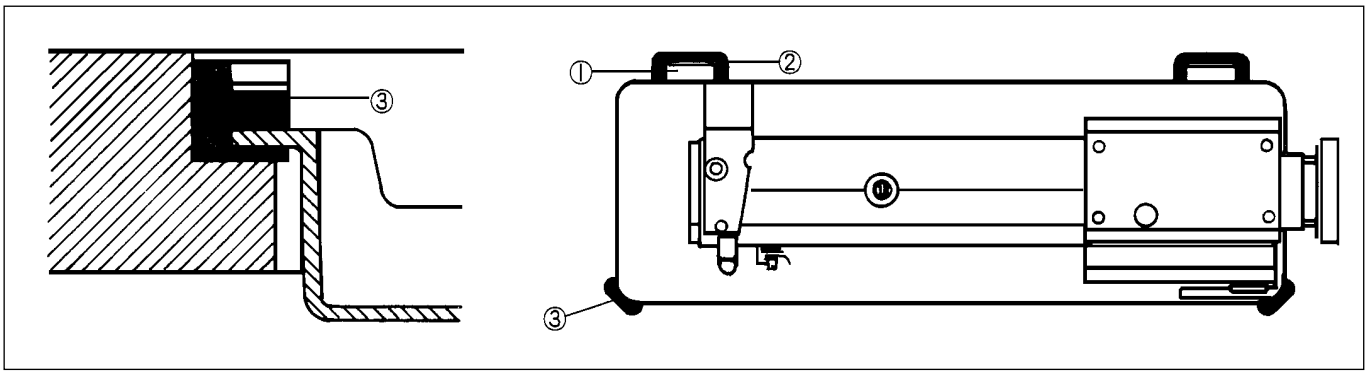
Name of option	Model	Application
Auto knee lifting system	SPF-2A	Solenoid structure. The presser foot lifts automatically by 1-step backward pedal movement
Production counter	SCOUN-1	A counting device which indicates the completed quantity on the program unit panel, including added, subtracted, corrected or remaining quantity along with other performance rates
Material edge sensor	SEDG-1A SEDG-2A	A device that senses the edge or thickness of the sewing material to stop the machine without manual pedaling. Available in two types: SEDG-1 for edge sensing type and SEDG-2 for thickness sensing type
Standing pedal	SPDL-1 SPDL-2	A device needed when only one operator runs several sewing machines. Pedals for acceleration, thread trimming, presser foot and ascending are built separately. Two types, SPDL-1 and EDPL-1 for fixed speed type and SPDL-2 and EDPL-2 for adjustable speed type are available.

2 INSTALLATION

Warning	
	▶The machine must be installed by a trained technician only.
	▶Any electrical wiring must be performed by a qualified technician or agent.
	▶The machines weigh over 35 kg. As such, two or more people should carry out the installation.
	▶Plug in only after the installation is complete. If the operator mistakenly steps down on the pedal with the plug in, the machine will start automatically and can cause physical injuries.
	▶Connect the ground (earth) wire. An unstable connection may result in an electric shock or a malfunction.
	▶Place the belt cover on top of the machine.
	▶Use both hands when bending the machine backward or returning it to the normal position. Using only one hand can lead to physical injuries due to the weight of the machine.

1) Installation of the machine head

※ Insert the head hinge ① into the bed hole and press it well with the rubber hinge (②. Place it in an upright position on the rubber cushion ③ at the corner as shown in the figure. (Refer to Figure 1).



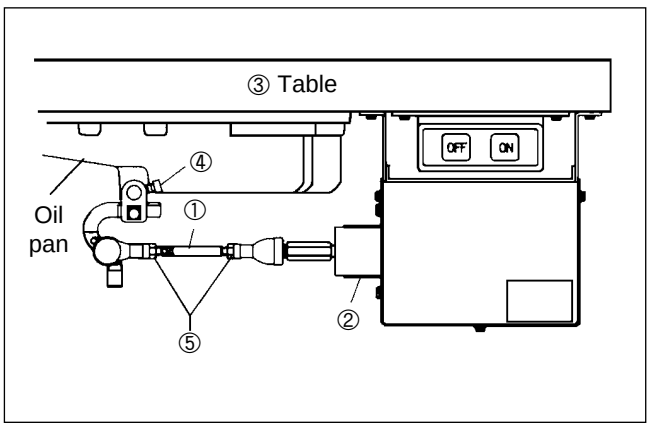
[Figure 1]

2) Installation of the knee-lifting solenoid and the power switch box

(※Refer to the assembly position map in the knee-lifting solenoid box)

A. Attach the solenoid onto the table. Loosen the fixing screw ④ to bring the center of the middle connecting rod ① and the center of the solenoid shaft ② to form a parallel with the lower side of the table ③. After adjustments, firmly tighten the fixing screw ④. (Refer to Figure 2)

B. Loosen the fixing nut ⑤ and turn the middle connecting rod ① in a clockwise direction to increase the lifting, and turn it counterclockwise to decrease the lifting. Firmly tighten the fixing nut ⑤ after adjustments.



[Figure 2]

⚠ Warning

▶Do not connect the power plug before lubrication is complete. If the user mistakenly steps on the foothold, the machine will start automatically and can cause physical injuries.

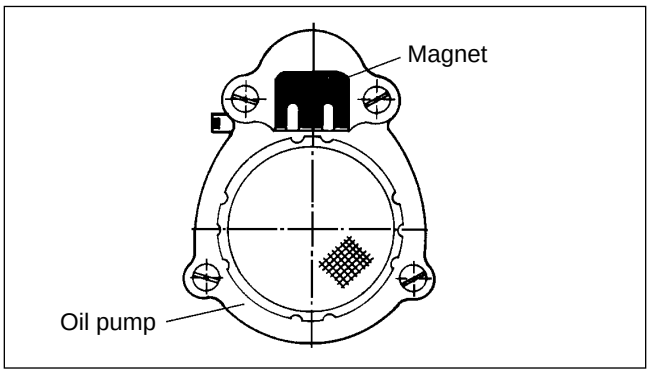
▶When handling lubricants, put on protective glasses or gloves to avoid contact with eyes or skin. Otherwise, inflammation can be caused. Do not drink lubricants to prevent diarrhea and vomiting. Be sure to keep the lubricants out of the reach of children.

▶Be sure to feed oil when using the machine for the first time, or when the machine has been left unused for a long time.

3) Lubrication

A. Installing a magnet for removing metal chips Place the chip-removing magnet from the accessory box onto the oil pump inside the bed. (Refer to Figure 3)

※ Do not use the magnet for other purposes. Operating the machine without the magnet can cause malfunctions. Use the magnet to ensure durability of the machine.



[Figure 3]

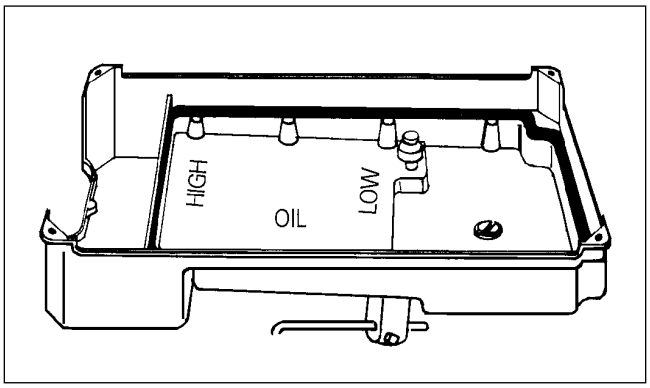
B. Feeding oil to the oil pan

a) Feed the oil to the "HIGH" mark. (Refer to Figure 4)

b) Be sure to use the oil for SunStar industrial-use sewing machines or TELLUS C10 from SHELL.

c) When the oil is down to LOW level during operation, immediately fill up the oil to HIGH level.

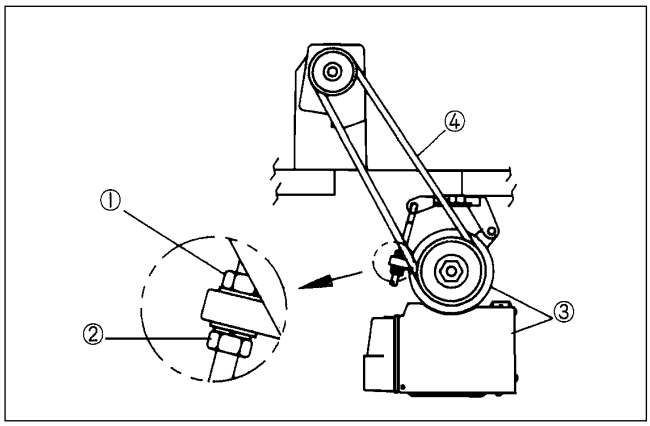
d) Replace oil at least once every two weeks.



[Figure 4]

4) Adjustment of belt tension

After the motor is installed, unfasten fixing nuts ① and ② to give tension to the belt ④ generated by the weight of the motor ③. At this point, fasten the fixing nut ① and fixing nut ② consecutively. (Refer to Figure 5)

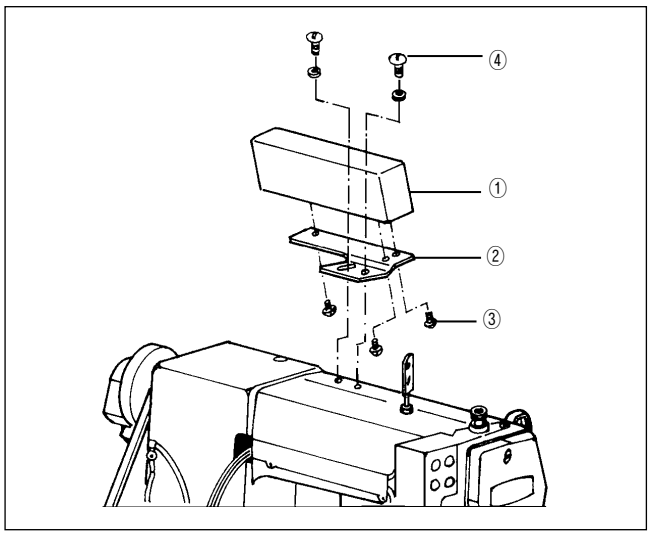


[Figure 5]

5) Installation of the program unit

A. Fix the attachment plate ② on the program unit ①with three fixing nuts ③.

B. Mount the unit firmly onto the machine head with two fixing bolts ④. (Refer to Figure 6)

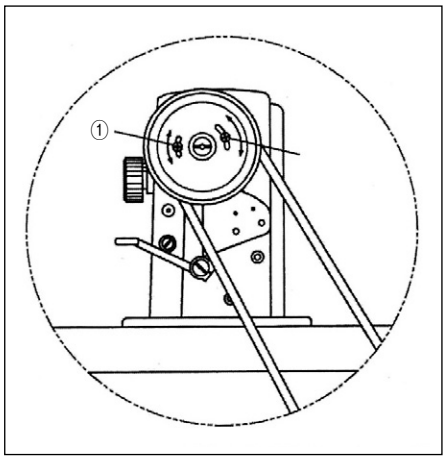


[Figure 6]

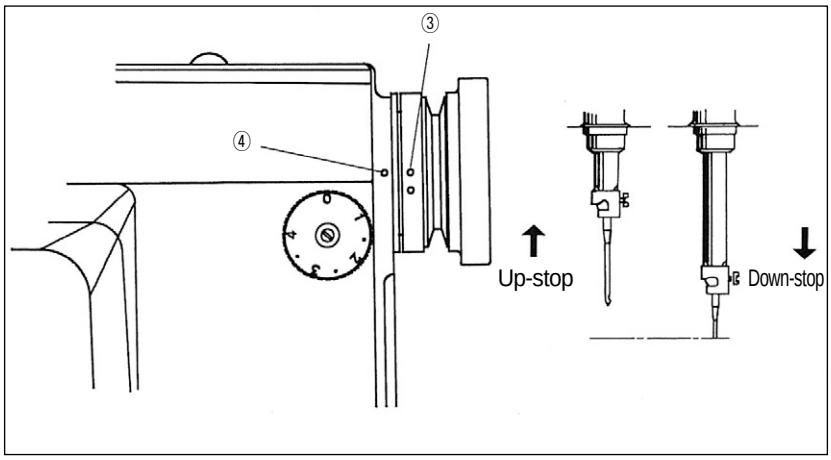
6) Assembly and adjustment of the synchronizer

(1) For in-built location detector

Adjust the up-stop position of the needle such that the white carved sign on the pulley ®È is in a straight line with the carved sign on the arm ®Í when the needle has stopped in the air. That adjustment can be made by loosening the pulley's clamp screw®Á on the side with N°§U carved signs and moving it sideways. Adjust the down-stop position of the needle such that the needle is on the point of moving up when the needle bar is at the lowest point. This adjustment can be made by loosening the pulley's clamp screw ®Ë on the side with N°§D carved signs and moving it sideways. (See, Figure 7&8)



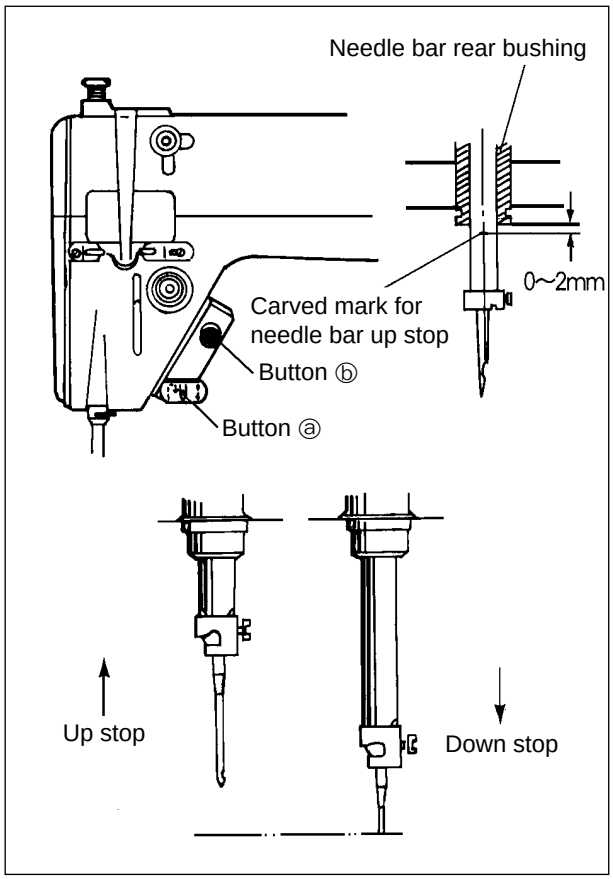
[Figure 7]



[Figure 8]

7) Checking stop position of the sewing machine

Press the button ① to operate up/down position of the needle, and check the stop position of the machine. When the needle stops in up-stop position, check if the end surface of the needle bar rear bushing and the carved mark at the lower end of the needle bar come within 0~2mm range. Inaccurate stop positions can cause malfunctions in trimming function. Be sure to adjust the photo film position of the synchronizer. The needle up-stop position and the needle bar stop position after trimming must be the same to ensure proper trimming timing.
(Refer to Figure 14)(Refer to synchronizer adjustment method on page 13)



[Figure 14]

8) Functions of button ⓐ

Press the button ⓐ during forward sewing to immediately perform reverse sewing. To begin reverse sewing from the start, stop the sewing machine and press the pedal while pressing the button ⓐ, and run the machine by pedaling. You can change up/down position of the needle bar by touching the button ⓐ while the machine is in the stop mode. When the needle bar is in its down-stop position, touch the button once lightly to change to up-stop position. When the needle bar is in its up-stop position, press the button twice within a second to change to down-stop position. The button ⓐ can perform both reverse sewing and changing needle up/down.(Refer to Figure 14)

9) Functions of button ⓑ

When you select the back tack function in the program unit and start sewing after pressing the button ⓑ once as shown in Figure 14, the back tack function will not start but instead, forward sewing will begin. When you want to do back tack during sewing, stop the machine and press the button ⓑ once and start sewing, then the back tack function, as initially set in the program unit will begin. When trimming is done after end-back tack work, stop the machine, press the button once and start trimming. The trimming function will begin without having the end-back tack work performed beforehand. (Button for arbitrarily inserting/deleting back tack)

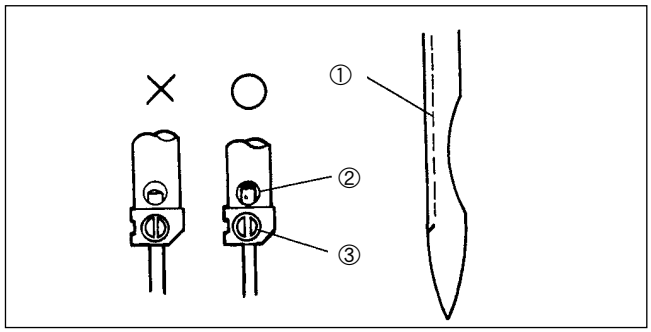
3 ADJUSTMENT OF THE SEWING MACHINE

⚠ Caution

- When installing a needle, be sure to turn the power switch off. If the user mistakenly steps on the foothold, the machine will automatically start and can cause injuries.
- The clutch motor will continue to run for a while due to inertia even after you turn the power switch off. Be sure to work with the sewing machine after the motor comes to a complete stop.

1) Inserting a needle

With the groove ① of the needle facing inwards, press the needle tip against the upper side of the stopper hole ②. Fix the needle with a tightening screw ③. (Refer to Figure 13)



[Figure 13]

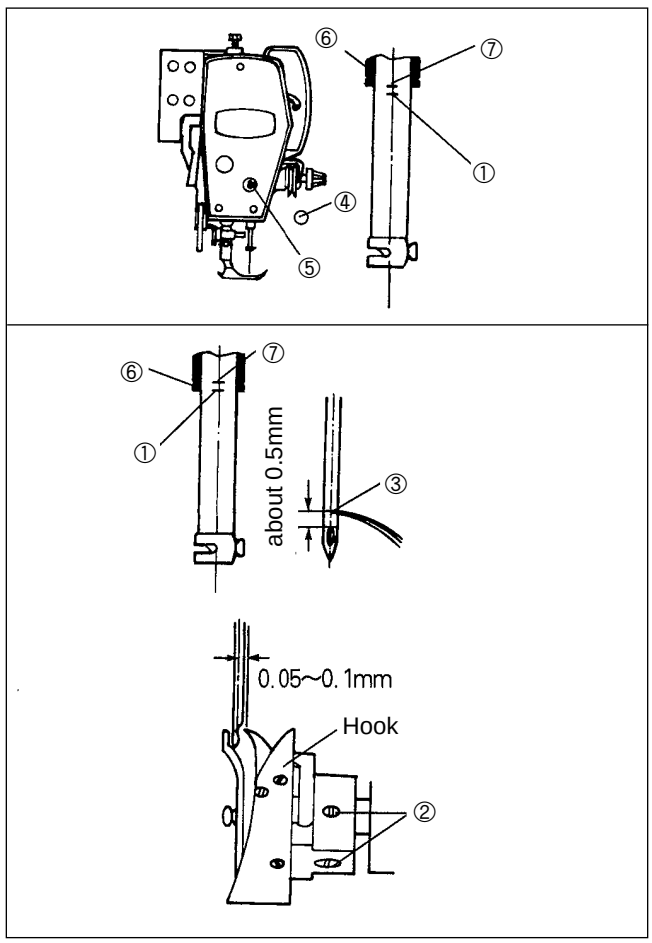
2) Adjusting a needle bar

As shown in Figure 14, take out the rubber cap ④ of the needle bar-adjusting hole in the faceplate. Turn the pulley to bring the needle bar to its lowest point and loosen the screw ⑤ of the needle bar holder. Adjust the needle bar to bring the lower side of the needle bar rear bushing ⑥ to align at a carved mark ⑦ where the lowest point of the needle bar comes to. Then, fix firmly with the screw ⑤ and cover with the rubber cap ④.

3) Timing adjustment of the needle and hook

As shown in Figure 14, align the lower side of the needle bar bushing ⑥ with a carved mark ① in the needle bar. Loosen three screws ② of the hook.

Turn the loose hook to align the upper tip ③ of the hook with the needle center. Set the distance from the inside of the groove to the upper tip of the hook ③ at 0.05~0.1mm. Re-tighten with the three screws ②.



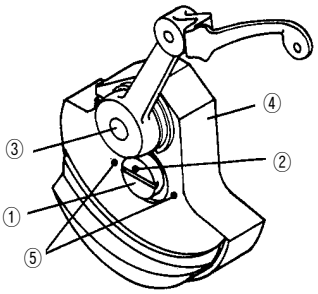
[Figure 14]

⚠ Caution

▶When checking lubrication of the thread take-up unit and the hook, keep your hands or oil check paper away from peripheral feeding devices in order to prevent injuries.

4) Adjusting the oil supply of thread take-up unit

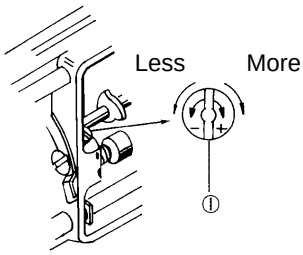
As shown in Figure 15, the level of oil supply will increase when a dot ② in the lubrication-adjusting pin ① aligns with the center hole of the thread take-up lever crank shaft ③. When you adjust the dot closer to a carved dot ⑤ in the link cam ④, the level of oil supply will decrease. Also, no oil will come out when you adjust the carved dot ② to move pass the carved dot ⑤. (The left/right adjustment range of the lubrication-adjusting pin ① is 90˚.)



[Figure 15]

5) Adjusting the oil supply of the hook

As shown in Figure 16, the level of oil will increase as you turn the screw ① inserted in the lower shaft front bushing, in a clockwise direction (+). Turn it counterclockwise (-) to reduce the oil supply.



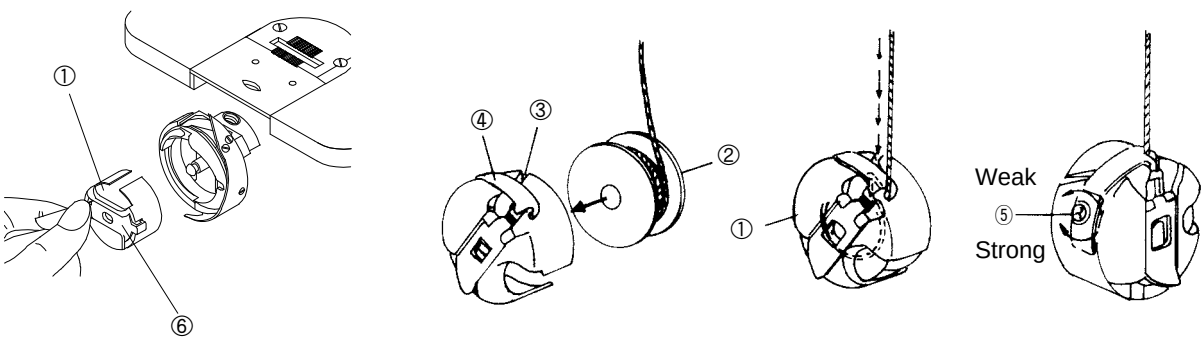
[Figure 16]

⚠ Caution

▶When adjusting lower thread tension, be sure to turn the power switch off.
If the user mistakenly steps on the foothold, the machine will start automatically and can cause injuries.

▶ The clutch motor will continue to run for a while due to inertia even after you turn the power switch off. Be sure to work with the sewing machine after the motor comes to a complete stop.

6) Placing lower thread and adjusting tension



[Figure 17]

A. Insert the bobbin ② in the bobbin case ①. Insert thread into the thread groove ③ and place it under the tension-adjusting plate spring ④. Turn the tension-adjusting screw ⑤ clockwise to raise the tension of lower thread, and turn it counterclockwise to reduce the tension. Adjust the dropping tension of lower thread, so that when you hold the end of the thread and drop the bobbin case ①, the thread can come out only by a small margin due to weight. (Refer to Figure 17)

B. How to install/separate the bobbin caseHold the bobbin case handle ⑥ and insert it into the hook. When taking out the bobbin, hold the handle ⑥ and pull. (The bobbin ② will come off when you let go of the handle.) (Refer to Figure 17)

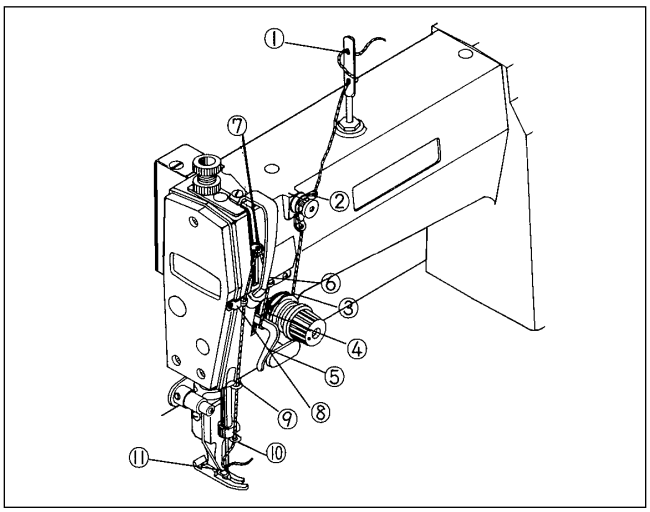
⚠ Caution

▶When routing upper thread, turn the power switch off. If the user mistakenly steps on the foothold, the machine will start automatically and can cause injuries.

▶ The clutch motor will continue to run for a while due to inertia even after you turn the power switch off. Be sure to work with the sewing machine after the motor comes to a complete stop.

7) Routing upper thread

With the thread take-up lever at its highest position, route upper thread in sequence as shown in Figure 18. The appropriate length of upper thread dropping from the needle hole during initial sewing is 50mm. (Refer to Figure 18)



[Figure 18]

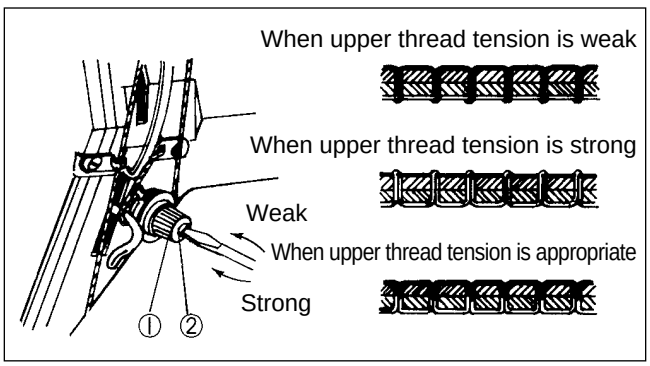
8) Adjusting upper thread

A. Main thread adjusting device

Turn the nut ① of thread adjusting device in a clockwise direction to increase the upper thread tension, and turn it counterclockwise to weaken the tension. As tension adjustment of thread varies by material type, thread, the number of stitch and other sewing conditions, be sure to adjust the tension properly. Refer to Figure 19.

B. Tension adjustment of thread take-up spring

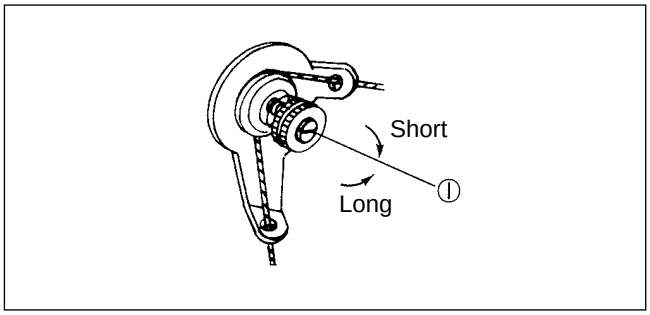
Use a driver to turn the groove ② at the tip of the thread adjusting device shaft. Turn it clockwise to increase the tension of the thread take-up spring and turn it counterclockwise to decrease the tension. See Figure 19.



[Figure 19]

C. Auxiliary thread adjusting device

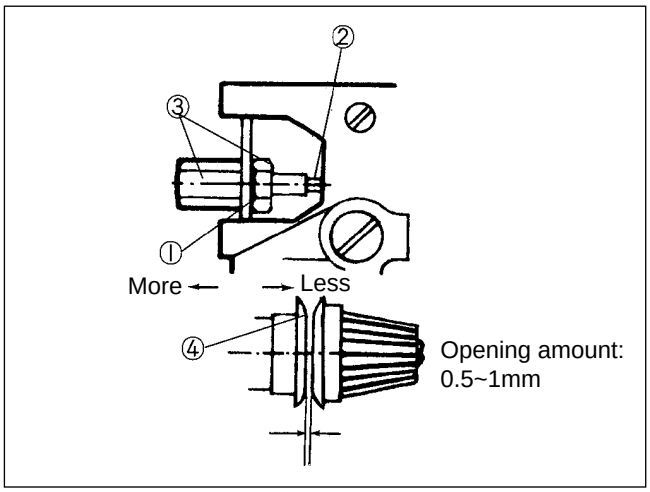
Turn the auxiliary thread tension-adjusting nut ① clockwise to shorten the thread remaining in the needle after trimming. Turn it counterclockwise to lengthen the remaining thread. The appropriate length of upper thread that remains in the needle after trimming, is 30~40mm. See Figure 20.



[Figure 20]

D. Adjusting the operating amount of thread release

The thread release function starts simultaneously with the movement of trimming cam. As shown in Figure 21, move the thread release wire ② connected to the operating lever ①, left and right to adjust the operating amount of thread release. Loosen two fixing nuts ③, bring the cable wire ② to the left, and fix the nuts ③ to increase the operating amount of thread release. Bring the cable wire to the right and tighten the nuts ③ to decrease the amount. After adjustments, firmly tighten back the nuts ③ and operate the thread release. Check if the thread guide dish ④ of the thread adjusting device opens 0.5~1mm. Make sure that the thread guide dishes ④ coincide with each other after operation. The stroke of thread release lever ① is 5mm. Adjust so that when the cable wire ② is pulled 0~2mm, the thread guide dish ④ does not open, and opens only when the cable wire is pulled 2~5mm. (Refer to Figure 21).

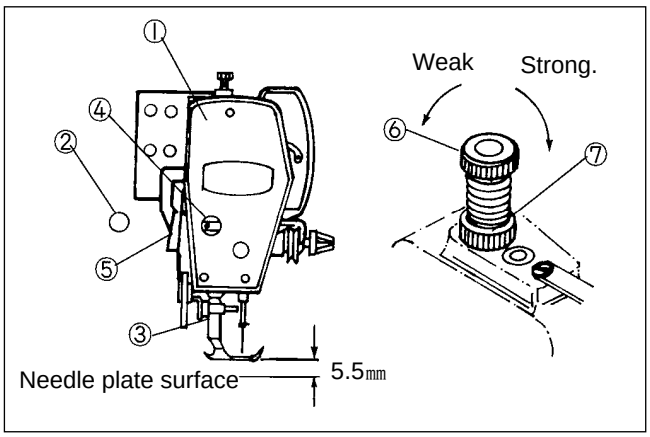


[Figure 21]

9) Adjusting presser foot height and pressure

A. As described in Figure 22, take out the rubber cap ② of the faceplate ①. Place the presser foot ③ on the needle plate. Loosen the screw ④ of presser bar handle to adjust the height of the presser bar handle. When the presser bar handle is lifted up, the height of the presser foot ③ will go down, and when brought down, the height will go up. Run the presser foot lifter ⑤ manually to lift the lower side of the presser foot 5.5mm off of the upper side of the needle plate.

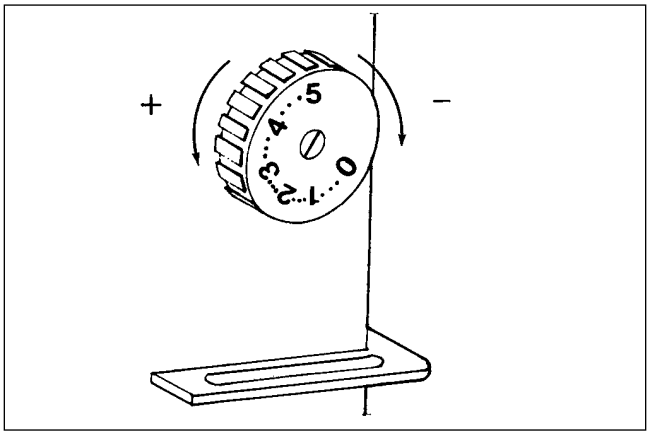
B. As shown in Figure 22, turn the pressure-adjusting screw ⑥ clockwise to increase the pressure of the presser foot, and turn it counterclockwise to decrease the pressure. After adjustments, make sure to tighten the fixing nut ①.



[Figure 22]

10) Adjusting stitch length

As illustrated in Figure 23, the number on the stitch-adjusting dial ① shows the stitch length in mm. Turn left and right to get a desired stitch length. (The stitch length will decrease when turned clockwise, and increase when turned counterclockwise.)



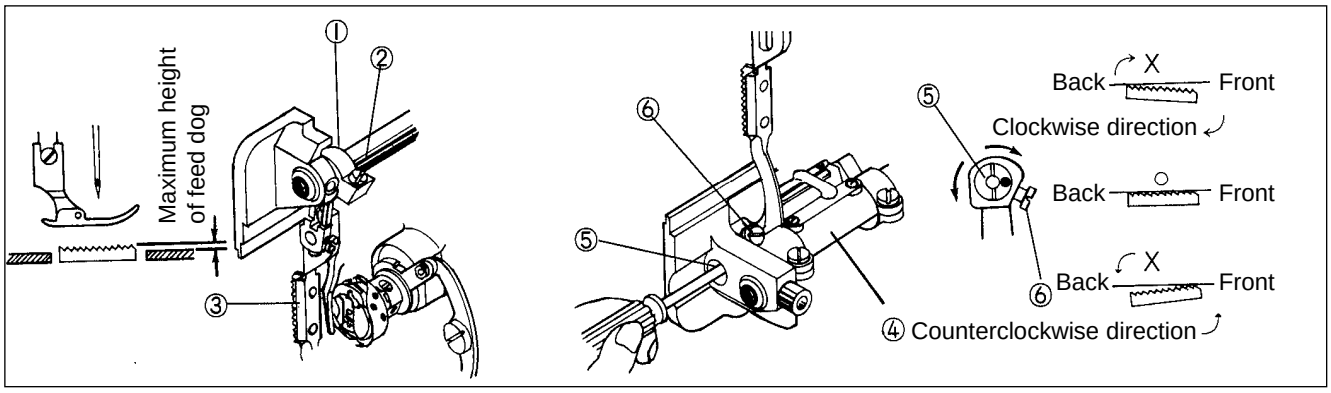
[Figure 23]

⚠ Caution

- ▶After disassembling and adjusting a safety device, always place it back to the original position and check whether it functions as intended.
- ▶Use both hands when pushing the machine backward or returning it to the original position. Due to the weight of the machine, your hand can get stuck in the machine if you should slip.
- ▶When adjusting the machine with the switch on, be sure to pay extreme caution.

- ▶Only trained engineers must perform troubleshooting or inspection of the machine.
- ▶For electrical repair or inspection, consult with qualified technicians or agent.

11) Adjusting feed dog height and inclination



[Figure 24]

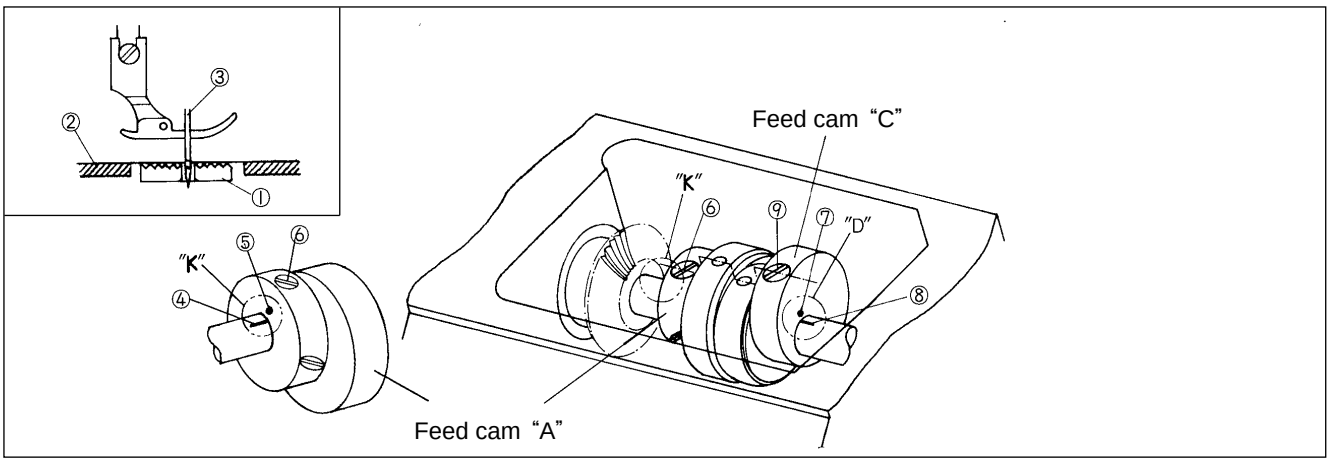
A. To adjust the height of the feed dog, unfasten the screw ② of the holder crank (unit) and move the holder crank (unit) ①. To adjust the height, set the stitch length at a maximum, and lift the feed dog to the highest position. At this point, the standard height from the faceplate of the needle plate and the end of the feed dog should be 0.8mm for light sewing materials, 1mm for medium heavy and 1.2mm for heavy sewing materials. (Refer to Figure 24)

B. To adjust the inclination of the feed dog, loosen the screw ⑥ of the horizontal pusher crank ④. Use a driver to turn the inclination-adjusting shaft ⑤ left and right up to 90°. Turn the shaft ⑤ clockwise to raise the rear of the feed dog, and turn it counterclockwise to raise the front of the feed dog. (Refer to Figure 24)

C. The height of the feed dog ③ changes as the inclination is adjusted. Adjust the height of the feed dog afterwards.

12) Adjusting the feed cam

As shown in Figure 25, turn the pulley by hand to lower the end of the feed dog ①. When it aligns with the upper side of the needle plate ②, adjust the upper end of the needle hole of the needle ③ to align with the upper side of the needle plate ②. Also at this point, the upper shaft carved line ④ and the carved dot ⑤ of the feed cam "A" will come in alignment with "K" as shown in Figure 25. Afterwards, adjust the feed cam "A" and "C" by bringing the carved dot ⑦ of the feed cam "C" and the upper shaft carved line ⑧ in alignment with "D". At this point (when the standard feed cam adjustment is complete), the center of no. 2 screw ⑥ of the feed cam "A" and the center of no. 1 screw ⑨ of the feed cam "C" will have come in alignment. Depending on the type of sewing materials, however, the center of no. 2 screw ⑥ and that of no. 1 screw could be slightly off from a straight line.



[Figure 25]

13) Timing adjustment of trimming devices

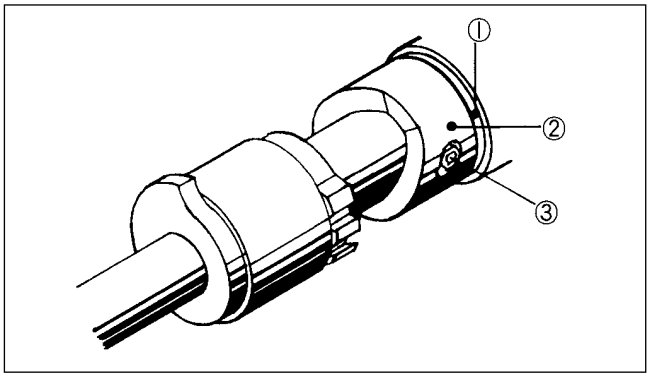
A. Turn the pulley by hand to bring the needle bar accurately to its lowest point. Bring the carved dot ① of the lower shaft middle bushing in the bed, with the location dot ② of the trimming cam. Tighten with two fixing screws ③. (Refer to Figure 26)

B. Fixing the "B" position of trimming drive gear

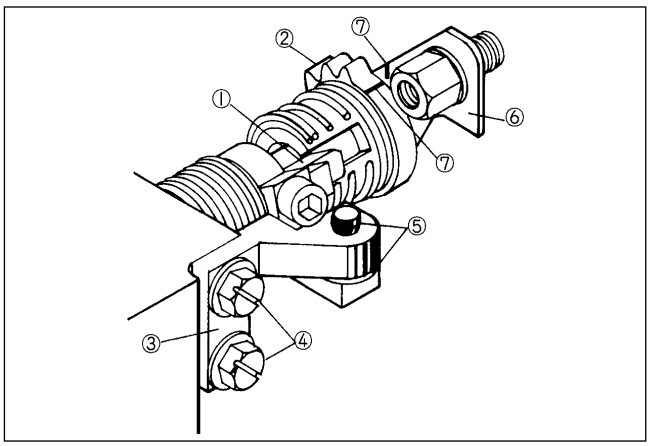
a) As shown in Figure 27, check how the trimming drive gear "B" ② is inserted into the stopper lever ①.

b) With the stopper lever ① pressed against the stopper rubber ⑤ of the stopper ③, loosen two fixing screws ④.

c) Move the trimming drive gear "B" ②, and adjust the stopper ③ up and down in order to align the thread release drive lever ⑥ with the carved line ⑦ of the trimming drive gear "B". Tighten two fixing screws ④ firmly while the baselines are aligned with each other.

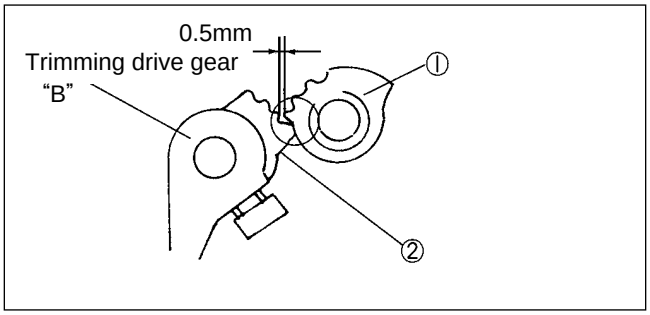


[Figure 26]



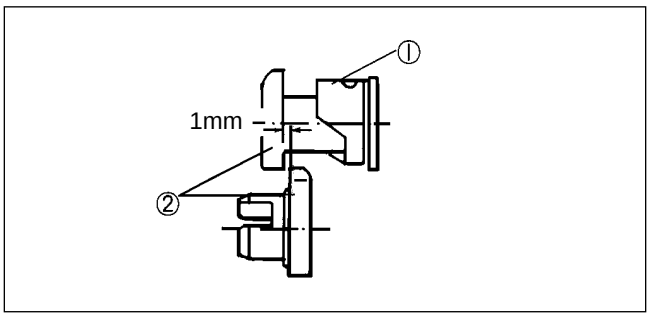
[Figure 27]

d) After adjustments, operate the trimming cam ① to see if the front side of the assembly gear ② is 0.5mm from the front side of the first gear of the trimming cam. (Refer to Figure 28)



[Figure 28]

e) When the trimming cam ① is not in operation, also check if the two gears ② are 1mm apart from each other as shown in Figure. (Refer to Figure 29)

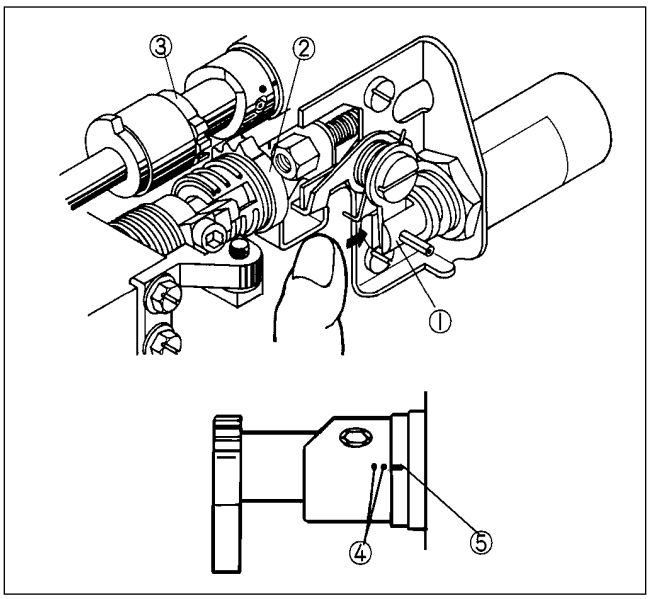


[Figure 29]

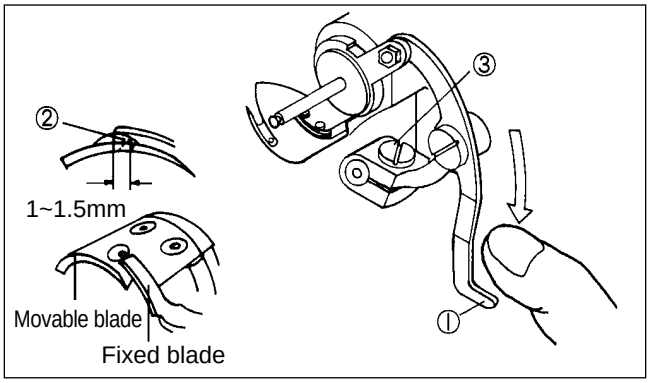
C. Adjusting the operating amount of the movable blade

a) When the needle begins to rise from its lowest point by turning the pulley forward, press the solenoid shaft ①. With the shaft pressed in, turn the pulley to bring the trimming drive gear "B" ② against the trimming cam gear ③. When two points ④ on the trimming cam come to align with the carved point ⑤ of the lower shaft middle bushing as shown in Figure, stop the rotation of the pulley immediately. (The trimming lever screw should be unfastened, as shown in Figure 31)

b) At this point, press down the connecting link ① in Figure 31. When the cutting edge ② on the hill of the movable blade goes 1~1.5mm farther than the fixed blade upper tip, fix the trimming lever screw ③. The stroke of the movable blade at this point is equivalent to the stroke when trimming begins.



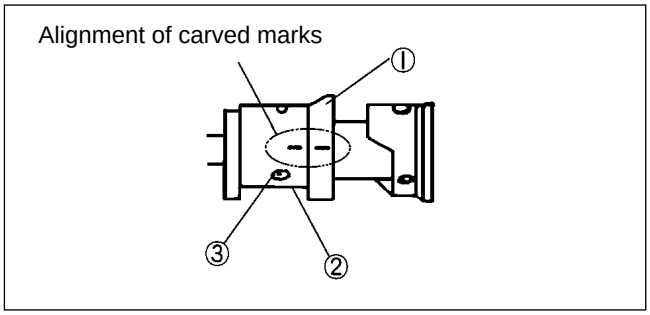
[Figure 30]



[Figure 31]

D. Position setting of the safety device cam

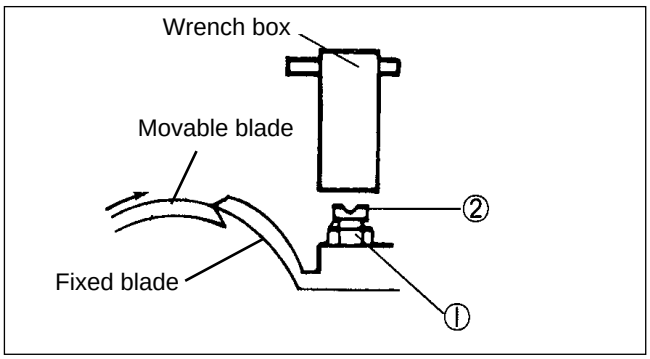
As shown in Figure 32, align the carved mark on the safety device cam ② with the carved mark on the outer part of the trimming cam ①. Firmly tighten two screws ③.



[Figure 32]

14) Tension adjustment of the fixed blade

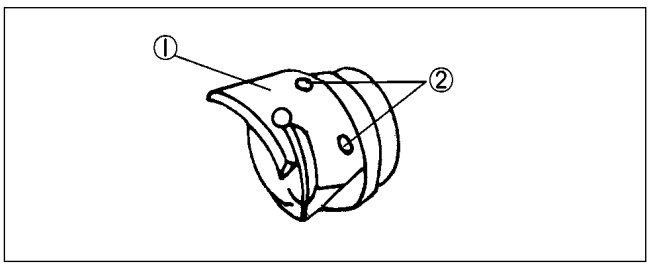
Loosen the fixed blade tension nut ① with a wrench box and unfasten the tension screw ②. When the upper tip of the movable blade moves to align with that of the fixed blade as shown in Figure 33, adjust the fixed blade tension screw to ensure the two tips meet without difficulties. After adjustments, be sure to use the wrench box from the accessory box to fasten the tension nut ①.



[Figure 33]

15) Replacing the movable blade

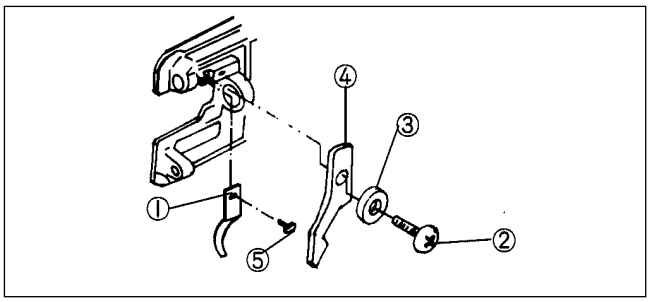
Turn the pulley manually to bring the needle up to its highest position. Take out the needle plate first and unfasten two fixed blade screws ② to remove the movable blade ① as shown in Figure 34. When assembling the replacement parts, follow this instruction in a reverse sequence.



[Figure 34]

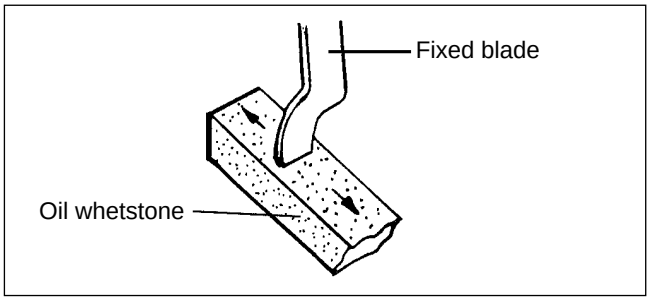
16) Replacing the fixed blade

A. Unfasten the inner spindle stopper fixing screw ②, take out the washer ③ and the inner spindle stopper ④, and loosen the fixed blade ① screw ⑤ to remove the fixed blade. When assembling the replacement parts, follow this instruction in a reverse sequence.



[Figure 35]

B. If the edge of the fixed blade is worn out, be sure to grind the edge against the oil whetstone.



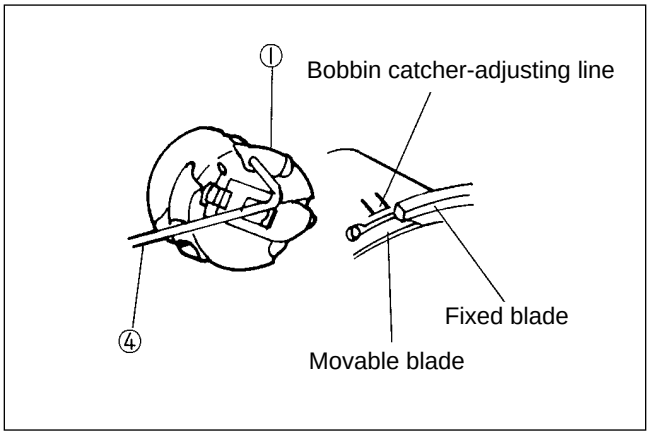
[Figure 36]

17) Adjusting the bobbin catcher

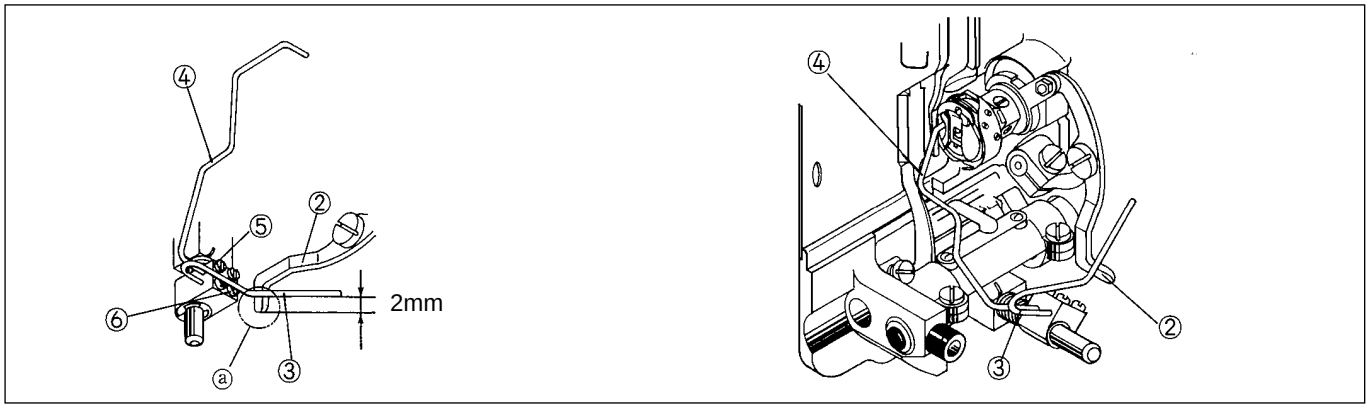
A. Adjusting the bobbin catcher lever

With the bobbin catcher lever ③ not in motion, unfasten the lever screw ⑥ to bring the tip of the bobbin catcher lever ③ against the end of the connecting link ② as shown with ⓐ in Figure 38.

B. Run the trimming function manually. As the movable blade moves forward and the end tip of the fixed blade comes to align with the bobbin catcher-adjusting line as shown in Figure 37, stop the machine. At this point, unfasten the bobbin catcher screw ⑤ so that the contact surface of the bobbin catcher ④ touches smoothly with the middle of the projecting part of the bobbin ①. See if the bobbin catcher returns smoothly after trimming.



[Figure 37]

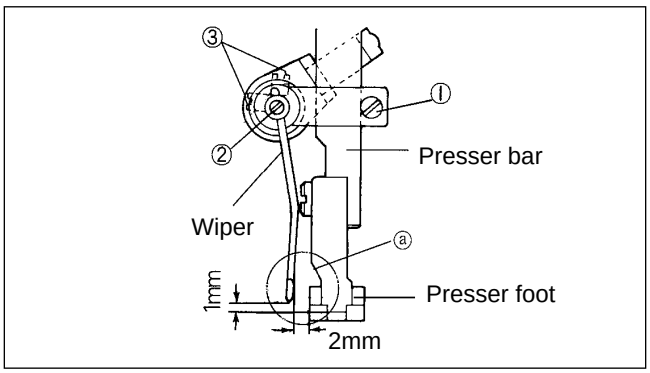


[Figure 38]

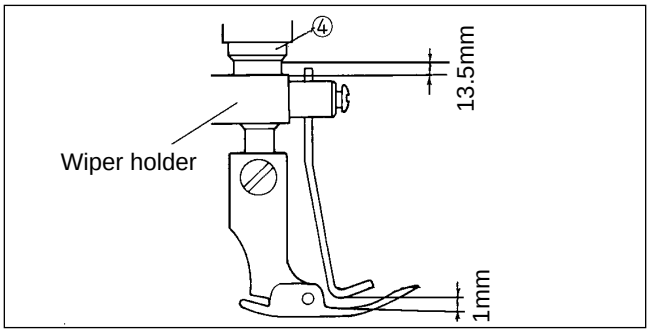
18) Adjusting the wiper

As shown in Figure 39, loosen the wiper holder screw ① to bring ⓐ in parallel with the left surface of the presser foot. Assemble so that the lower side of the presser bar bushing ④ is 13.5mm apart from the upper side of the wiper holder as shown in Figure 40. Manually run the wiper, and set a clearance between the lower side of the wiper and the gap in the upper side of the presser foot at 1mm. Fix with the screw ②.

By using two wiper shaft screws ③, set a clearance of 2mm between the right side of the wiper and the left side of the presser foot when the wiper is not in motion. Tighten with screws after adjustments.



[Figure 39]



[Figure 40]

4 CAUSE OF TROUBLES AND TROUBLESHOOTING

1) Sewing machine troubleshooting

No	Symptom	Checkpoints	Root cause	Corrective action
1	Needle breaks	Direction and height of needle	Needle is inserted into wrong position	Reinsert the needle correctly
		Needle	Needle is bent	Change the needle
			Bad timing of feed dog	Adjust the timing of feed dog
		Ascending level of needle bar	Bad timing of needle and hook	Adjust the timing of needle and hook
		Height of needle	Bad timing of needle and hook	Adjust the timing of needle and hook
		Gap between needle and hook	Bad timing of needle and hook	Adjust the timing of needle and hook
2	Thread breaks	Threading method	Wrong threading	Thread the needle correctly
		Needle	Bent needle or broken needle tip	Change the needle
		Direction and height of needle	Needle inserted in the wrong position	Insert the needle correctly
		Upper thread tension	Too tight upper thread tension	Reduce tension of upper thread
		Lower thread tension	Too loose lower thread tension	Reduce tension of lower thread
		Operating capacity of take-up lever spring	Loose upper thread	Adjust take-up lever spring
3	Stitch skips	Direction and height of needle	Needle inserted into wrong position	Reinsert the needle in the right direction
		Needle	Bent needle or broken needle tip	Change the needle
		Threading	Thread passing at wrong position	Thread the needle correctly
		Ascending level of needle bar	Wrong timing of needle and hook	Adjust the timing of needle and hook
		Height of needle bar	Wrong timing of needle and hook	Adjust the timing of needle and hook
		Gap between needle and hook	Wrong timing of needle and hook	Adjust the timing of needle and hook

No	Symptom	Checkpoints	Root cause	Corrective action
3	Stitch skips		Remaining length of upper thread is short	Adjust the thread adjusting device
		Racing-proof spring of bobbin case	Due to bobbin racing during trimming, lower thread dropping from bobbin case becomes too short to go up	Change the racing protection spring
		Take-up lever spring	Unable to lift lower thread due to weak take-up lever spring	Adjust the working capacity of take-up lever spring
4	Upper thread does not sink		Too tight upper thread tension	Reduce tension of upper thread
			Too loose lower thread tension	Increase tension of lower thread
5	Lower thread does not sink		Too weak upper thread tension	Increase tension of upper thread
			Too strong lower thread tension	Decrease tension of lower thread
6	Trimming errors	Tension of fixed blade	Tension not aligned between movable and fixed blade	Adjust tension of movable and fixed blade
		Edge of movable and fixed blades	Abrasion in blade groove of movable and fixed blade	Replace movable and fixed blade
		Direction of needle	Wrong needle insertion	Reinsert the needle correctly
		Check crossing between trimming cam scales and blades	Insufficient crossing between the fixed and movable blades	Set the stroke of the movable and the fixed blades
7	Upper thread comes off when sewing starts		Too tight upper thread tension	Adjust upper thread tension
			Needle is too thick for the thread	Check the needle thickness
		Check the needle up-stop position	The thread take-up lever pulls out the thread due to too high needle up/down position	Set the needle up-stop position

5 TABLE DRAWING